

Supplementary Information: Soiled adhesive pads shear clean by slipping—A robust self-cleaning mechanism in climbing beetles

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	Glass ($N = 9$)	Dock leaf ($N = 20$)
Contact angle (water) [deg]	8.1 ± 1.0	49 ± 9.7
Contact angle (diiodo-methane) [deg]	49 ± 1.5	56 ± 5.0
Surface free energy [mN/m]	74 ± 1.4	54 ± 9.0
Disperse part [mN/m]	35 ± 0.8	31 ± 2.6
Polar part [mN/m]	39 ± 0.6	23 ± 6.4

Table S1: Contact angle and surface free energy measurements for glass and dock leaf substrates.

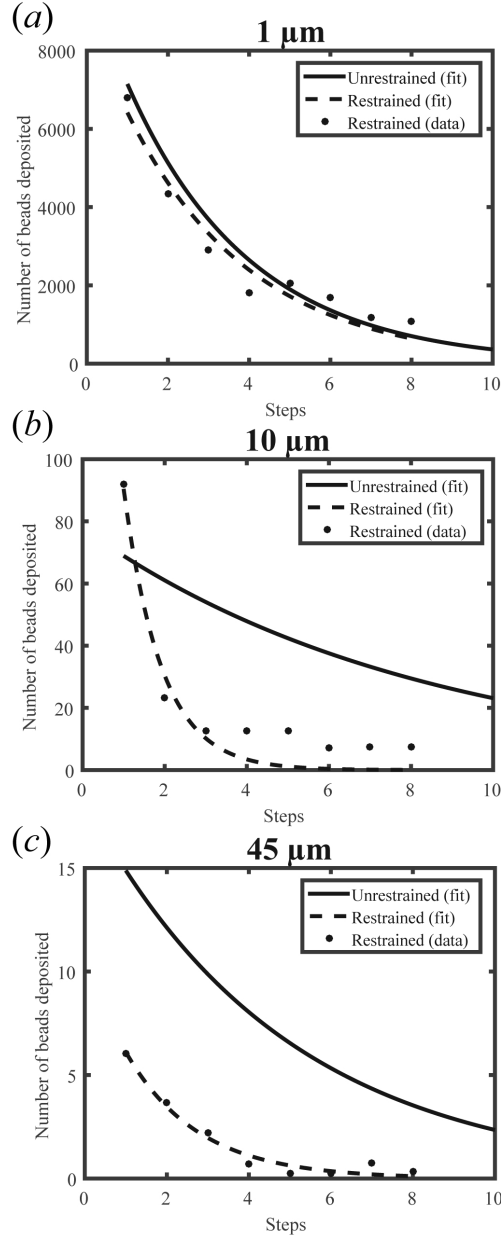


Figure S1: Comparison of unrestrained (data of present study) and restrained (Clemente *et al*, 2010 [1]) climbing beetles. (a-c) Number of microbeads removed per step by climbing beetles onto a glass surface for (a) 1- μm , (b) 10- μm , and (c) 45- μm polystyrene beads. Exponential fits are tabulated in Table S2.

$N_p = ae^{bN_s}$							
	Bead size	Coefficient a	95% confidence bounds	Coefficient b	95% confidence bounds	R^2	Source
Unrestrained	1 μm	9949	(2887, 17010)	-0.3309	(-0.6141, -0.04766)	0.6019	Here
	10 μm	77.78	(55.5, 100.1)	-0.1213	(-0.1857, -0.05685)	0.734	Here
	45 μm	18.27	(10.32, 26.23)	-0.2052	(-0.3309, -0.0796)	0.7215	Here
Restrained	1 μm	8909	(6934, 10880)	-0.3283	(-0.4185, -0.2381)	0.9509	Clemente <i>et al</i> (2010)
	10 μm	269	(87.91, 450)	-1.09	(-1.656, -0.5241)	0.927	Clemente <i>et al</i> (2010)
	45 μm	10.77	(8.115, 13.43)	-0.5669	(-0.7126, -0.4211)	0.9734	Clemente <i>et al</i> (2010)

Table S2: Exponential fits for number of beads removed per step for unrestrained and restrained beetles. Restrained data is taken by curve fitting results from Clemente and co-authors [1].

References

- [1] Clemente, C. J., Bullock, J. M., Beale, A. & Federle, W. Evidence for self-cleaning in fluid-based smooth and hairy adhesive systems of insects. *Journal of Experimental Biology* **213**, 635–642 (2010).